The Role of Systemic Structures in Diabetes Technology Disparities

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction:

Diabetes is one of the most common diseases in the world, with more than 10% of the world's population having diabetes (International Diabetes Federation, 2024). The International Diabetes Federation has projected that by 2045, the number of people who have diabetes will increase to 1 in 8 people. Diabetes exists in two forms, type I and II diabetes, with type I being the more serious of the two categories. Specifically, type I diabetes (T1D) is a chronic disease categorized by the body's inability to produce insulin, causing blood glucose levels throughout the body to be unregulated. (Krause, 2023, p. 4279) According to a 2016 study, around 5% of diagnosed diabetes patients in the United States had T1D, representing around 1.7 million adults and 350,000 children and adolescents (Centers for Disease Control and Prevention, 2024).

To manage their condition, T1D patients use diabetes devices, like blood glucose monitors (BGMs), continuous glucose monitors (CGMs), insulin pumps, or others, to manage their blood glucose and insulin levels. CGMs are wearable body sensors that take blood glucose readings every 5-15 minutes and are crucial to the management of T1D, offering diagnostic information to T1D patients and providers about blood glucose trends and alerting the patient when blood glucose levels are high/low (Klonoff, 2017, p. 178-192). T1D patients must also use devices to administer insulin, like insulin pens and pumps. Insulin pumps automatically administer pre-set doses of insulin throughout the day. T1D patients benefit from using insulin pumps, as they have been shown to decrease average blood glucose levels across the span of several months and decrease the number of hypoglycemic events (Pickup, 2012, p. 425-433) .

This information indicates the importance for type I diabetes patients to have access to continuous glucose monitors and insulin pumps, however the price tag on these devices make it difficult for many T1D patients to gain access to these devices. Type I diabetes patients that don't use or have access to insulin pumps and continuous glucose monitors are at a higher risk of hypoglycemia, higher glucose variability, and lower time spent in the range of healthy glucose levels (Aleppo et al., 2021, p. 2729–2737). Because of this, it is incredibly important to address these disparities so that more T1D patients have access to these devices. This paper will outline a general overview of the American healthcare system that will contextualize the different insurance offerings for CGMs and insulin pumps and policies affecting them. Using the political economy of health framework and risk society theory, this paper will aim to understand how the current set up of the healthcare system and surrounding healthcare policies affect the existing disparities for diabetes technology. This paper argues that disparities in access to continuous glucose monitors (CGMs) and insulin pumps for Type 1 diabetes (T1D) patients stem from structural issues within the American healthcare system. By examining insurance offerings, healthcare policies, and systemic inequities through the political economy of health framework and risk society theory, this paper aims to reveal how these factors shape access to diabetes technologies and propose solutions to mitigate these disparities.

The American Insurance Landscape:

8% of the population in the United States is uninsured and have much less access to health services than insured individuals do. There are public health clinics and hospitals that are supported by federal, state, and local governments that offer some support to uninsured people, but overall it is difficult for uninsured people to get the adequate medical support that they need. Prior studies have shown that health trends in uninsured people were much worse compared to insured people (Lew et al., 2024, p. 154).

The American healthcare system is unique in its layout, presenting both public and private insurance options for its people and lacking a centralized, nationwide health insurance offering. The offerings across private and public health insurance differ significantly in terms of benefits, premiums, sources of financing, and more. While some insurance users may obtain both public and private coverage, there is often no coordination between these two types of insurance, indicating a heightened fragmentation in the insurance space (Lew et al., 2024, p. 151).

The most common way that American adults (and their dependents) receive private insurance coverage is through their employers, whereas government insurance offerings are mainly used by elderly, disabled, and poor. From the 2023 U.S. Census, 92% of the American population is insured, with 65.4% of the population using private insurance and 36.3% using a public plan. Furthermore, around 53.7% of the population is covered by employment-based insurance (Chua, 2006, p. 1-6).

The American government has two major public health insurance programs: Medicare and Medicaid. Medicare is offered to adults over the age of 65 and is the single largest health insurer in the country. Medicare is mainly directed towards short-term care and many longer-term services, like in-home nursing and routine eye care, are not covered by this plan. Medicare users must also pay coinsurance and deductibles fees for specific treatments and services. Because of the gaps in the Medicare offerings, many users enroll in supplemental private health insurance plans to support their medical needs (Lew et al., 2024, p. 152-153).

The Medicaid program is catered towards low-income and disabled people, and also extends to pregnant women, children, elderly, disabled, and parents of very low socioeconomic standing, specifically excluding childless adults. Medicaid is financed by both the state and federal governments, with state governments deciding the specificities of how Medicaid will be carried out within their state. There are several smaller public health insurance programs, including S-CHIP, which is used to insure children whose families aren’t eligible for Medicaid but also can’t cover private health insurance, and Veterans programs (Lew et al., 2024, p. 153-155).

People in the United States are also able to use private health insurance programs, most commonly through their employer. In these cases, employers provide health insurance to their employees as part of a benefits package. The insurance plans are usually through private companies, both for-profit and not-for-profit, and are financed by both the employers, who pay most of the insurance premium, and the employee, who pays the remainder of the premium. Others that don’t have access to private insurance through their employer may access private insurance programs through the individual market, bearing the full cost of insurance premiums. In the individual markets, health insurance companies have the capability to deny people coverage based on pre-existing conditions and differ cost-structures to different patients; healthy and lower-risk patients are usually charged lower premiums and sick, higher-risk patients are charged higher premiums. Private insurance programs are regulated by the state and insurance policies vary greatly across state lines (Chua, 2006, p. 1-6; Pestaina et al., 2024).

The structure of the American health insurance system, shaped by both public and private programs, directly influences access to essential medical technologies. While 92% of Americans have health insurance coverage as mentioned above, the remaining 8%, which is around 26 million people, remain uninsured despite available options. This gap persists due to several key barriers, but most significantly due to the high cost of insurance, with 63.2% of uninsured adults citing costs to be their primary barrier (Tolbert et al., 2023). Additionally, around 1.5 million adults with diabetes are uninsured. Uninsured diabetes patients have been found to be three times more likely to delay insulin purchases due to cost, five times more likely to be hospitalized for diabetic ketoacidosis, and less likely to receive preventive foot and eye exams (Casagrande et al., 2023).

For people with Type 1 diabetes, the high costs of continuous glucose monitors (CGMs) and insulin pumps make insurance coverage crucial in reducing the financial strain associated with these life-sustaining devices. CGMs cost between $2,000 and $7,000 per year without insurance (Watson, 2022), while insulin pumps average around $6,000 annually, with an additional $3,000 to $6,000 required for related supplies (Khan, 2022). These high costs highlight the need for Type 1 diabetes patients to have insurance coverage to alleviate the financial burden associated with these devices.

Associated Healthcare Policies:

There are several healthcare policies enacted by the federal government that have been used to regulate and increase the accessibility of public and private insurance programs. For over 50 years, the Employer Retirement Income Security Act (ERISA) has regulated employer-sponsored health coverage. Private insurers try to create a risk pool of people whose health matches the average of the US population, and by doing so, will try to prevent higher-risk patients from joining their insurance programs. While states have acted as the primary regulating body for private insurance programs, federal protections through ERISA have been used to address concerns with private insurance coverage including access, affordability, and adequacy by limiting the application of state policies over private employer-sponsored coverage (Pestaina et al., 2024).

Additionally, the Affordable Care Act, passed in 2010, has been used to expand the reach of public health insurance programs, targeting low- and middle-income individuals who are often left out of private and public insurance systems. It achieves this by broadening Medicaid eligibility to those earning up to 138% of the federal poverty level and by setting standardized benefits and cost-sharing for qualified health plans. Since the ACA was passed, there has been a significant drop in the uninsured rate, with about 20 million adults gaining coverage. Still, over 32 million people remain uninsured, despite many qualifying for Medicaid, CHIP, or subsidies for Marketplace plans. Before the ACA, insurers in the individual and small group markets could deny or discontinue coverage based on health status. The law brought major reforms to private insurance, ensuring greater consumer protections and eliminating these exclusionary practices (Kominski et al., 2020, p. 489-505; Pestaina et al., 2024).

In addition to ERISA and the Affordable Care Act, there are varying healthcare policies that affect how type I diabetes patients access continuous glucose monitors and insulin pumps specifically. While there is no consistent policy across all states that allows for T1D patients to access CGMs, there are common components in policies regarding CGMs in Medicaid programs across the states, for example a requirement that the patient is formally diagnosed with diabetes mellitus and has a prescription for a CGM from their doctor. 40 states out of 51 (including the District of Columbia) provide some sort of CGM coverage, with 20 covering CGMs as a DME (durable medical equipment) benefit and 20 as a pharmacy benefit. By using a DME benefit, the patient must comply with a DME company, which often has their own set of exclusion criteria that can make navigating these benefits more difficult. Furthermore, patients that use the DME benefits have reported long processing times and may need to receive frequent prior authorizations (even on a monthly basis) to receive their CGMs. While obtaining a CGM through a pharmacy benefit can be faster than the DME benefit pathway, these benefits may also have restrictive criteria, can be more expensive for states, and can be more difficult for patients and providers to navigate. Some states also require an endocrinologist to prescribe or consult on a CGM prescription, which further limits CGM access especially in underserved communities where there aren't many or any endocrinologists. Overall, the variable use of CGMs across the country, especially in marginalized communities and people of lower socioeconomic status may directly be caused by the differing and difficult-to-navigate healthcare policies associated with CGM access (Howe & Chavis, 2022, p. 9-21; Vrany et al., 2023, p. 1-8).

Similarly for insulin pumps, there are few consistencies in the healthcare policies that allow for type I patients to access this device. However, there have been significant changes in regards to insulin accessibility in the United States. Specifically, in 2017, the 21st Century Cures Act raised the cost of insulin by 251% overnight without warning patients and providers. In the following year and a half, the price of insulin increased again by 53%, causing patients to take on a 304% increase in the price of insulin within the span of two years. This price increase caused Medicare suppliers to decrease the number of claims for insulin pumps, causing an access issue for patients that needed to fill their prescriptions for pump-delivered insulin. The insulin price spike has also led to an underuse of insulin, with a study reporting that a quarter of interviewed patients either used less insulin than prescribed, didn't fill a prescription, or completely stopped using insulin altogether ((Brown-Georgi, Chhabra, & Vigersky, 2020, p. 1177-1180). Recently, the federal government established the Inflation Reduction Act, which limits the monthly copay for insulin to $35 for patients on Medicare ("Accessing Diabetes Care and Management," 2025).

Despite policy efforts to expand insurance access, significant disparities remain in the use of diabetes management technologies. A study from 2024 reported the demographics of CGM usage, with around 30% of type I diabetes patients using CGMs, and an additional study from 2023 reporting that around 66% of patients use insulin pumps. Both studies showed that the use of both of these devices have been increasing amongst T1D patients, indicating an ever-important need to help patients gain access to these devices (Lacy et al., 2024, p. 388-397; Gandhi et al., 2023, p. 56-64). While ~ 90% of diabetes patients in the US have health insurance, over 1.5 million adults with diabetes in the United States had no health insurance coverage. Additionally, health outcomes have been shown to vary based across insurance offerings, showing that patients with managed care and private insurance subscriptions had better health outcomes than patients with public insurance plans (Casagrande et al., 2023).

An Analysis of this Dynamic:

The disparities in CGM and insulin pump access and health outcomes makes it imperative to better understand the factors and dynamics that contribute to these challenges. One way to critically analyze these disparities and surrounding factors is through the political economy of health framework. This framework emphasizes the idea that politics and the economy can't be viewed as individual forces and that the two shape one another, and in the realm of healthcare, that both politics and economy interact to shape individual and larger population health outcomes. In the field of public health, the political economy of health framework has been used to question an increasingly capitalistic society that has disadvantaged the working class (Harvey, 2021, p. 293-300). Using this framework, we can further understand how the structures in places, as outlined above, have created the current issues in access to CGMs and insulin pumps.

Underlying the entire issue, it is clear in this healthcare and insurance landscape that continuous glucose monitors and insulin pumps are being viewed as commodities for profit instead of public health necessities, with prices driven by patent protections and limited competition (Kesselheim et al., 2016), which means that access to these technologies are swayed by market factors and budgets instead of medical need. The nature of the fact that medical devices and pharmaceuticals are created by corporations instead of public entities further plays into this dynamic and incentivizes profit-driven decision-making over patient well-being, leading to inflated prices, restricted insurance coverage, and unequal access based on socioeconomic status rather than medical need (Gray, 1986).

As mentioned previously, Medicare and Medicaid, the primary public healthcare programs in the United States, often fall short in providing adequate support for all individuals with diabetes through access to CGMs and insulin pumps. Coverage policies for these essential devices vary significantly across states and are subject to frequent changes, creating a complex and often confusing landscape for patients to navigate. Also, coverage policies are constantly shifted with political administrations, state budgets, and evolving diabetes research, leaving patients vulnerable to these dynamics. The state-by-state differences in Medicare and Medicaid offerings creates unequal access to CGMs and insulin pumps, reinforcing existing regional health disparities.

Furthermore, the necessity of obtaining a doctor's prescription for CGMs or insulin pumps adds another layer of complexity. Not all patients have a primary care physician (PCP) to facilitate this process, especially patients of lower socioeconomic status. The requirement for extensive documentation to demonstrate medical necessity can be a deterrent for both patients and providers. Insurance companies further complicate access by imposing restrictions on coverage for these essential diabetes management tools, disproportionately affecting higher risk patients including patients that are lower-income, elderly, or underinsured.

Additionally, a majority of people living in the United States rely on their employer for health insurance, which reinforces economic dependency on the employer. Employers can set the terms of their coverage and potentially lead to further disparities in access to these necessary diabetes devices, especially with corporate cost-cutting strategies which commonly aim to minimize the cost that the employer bears upon themselves for employee benefits. Also, unemployed people, part-time workers, or gig workers are commonly excluded from the benefits of employer-based insurance benefits, further exacerbating disparities for these groups.

Another framework that could be used to analyze the interaction between the current set up of the healthcare landscape and the disparities in access to diabetes technologies, such as CGMs and insulin pumps, is by using the risk society theory. This theory argues that modern societies are organized around managing human-made risks and that with these risks, there are a series of associated consequences (Ekberg, 2007, p. 343-366). Within the U.S. healthcare system, the current insurance models exacerbate these manufactured risks, as patients with diabetes face uncertain access to crucial diabetes technologies due to shifting policies, restrictive insurance requirements, and changing economic priorities.

A key component of risk society theory is the unequal distribution of risk, where marginalized communities disproportionately bear the burden of systemic failures. Low-income individuals and uninsured patients face higher barriers to access diabetes technologies due to financial constraints and regional disparities in Medicaid and Medicare coverage. This unequal distribution not only worsens health outcomes for these communities but also contributes to broader systemic consequences, as untreated or poorly managed diabetes can lead to higher long-term healthcare costs, increased emergency room visits, and greater strain on public health resources. These risks wouldn't just be confined to individual patients but would have larger effects on the entire healthcare system, potentially reinforcing existing inequalities and creating greater financial and medical instability in the future.

Furthermore, risk society theory highlights how institutional responses to risk can lead to unintended consequences and growing public distrust. As diabetes patients experience inconsistent policies, unaffordable treatments, and bureaucratic obstacles, dissatisfaction with the healthcare system and government institutions would grow, potentially leading to reduced engagement with healthcare providers, lower adherence to treatment plans, and worsening public health outcomes. When access to essential diabetes technologies is dictated by economic and political forces rather than medical necessity, patients are left navigating an unpredictable and unstable system that prioritizes cost efficiency over patient well-being. The erosion of trust in institutions, a central theme of risk society theory, is particularly relevant in the U.S. healthcare system, where patients increasingly question whether policies are designed to protect their health or serve corporate and governmental interests.

Proposed Solutions through Systemic Reform:

The structural inequities in the access to diabetes technologies demand interventions that address both immediate barriers and the root causes embedded in the U.S. healthcare system. By leveraging insights from the political economy of health and risk society theory, the following solutions offer a multi-faceted approach to confront the underlying profit-driven motives of the healthcare industry while dismantling bureaucratic barriers that disproportionately harm marginalized communities.

The lack of uniform insurance coverage and policies across state lines for diabetes technologies is a major driver of disparities. To eliminate this inequity, Congress should pass legislation mandating that all government programs adopt evidence-based standards for CGM and insulin pump coverage. This would ensure that low-income patients, regardless of their state of residence, can access these devices without facing arbitrary restrictions. Additionally, the Inflation Reduction Act's (IRA) cap on insulin costs (Centers for Medicare & Medicaid Services, 2023) should be expanded to include CGMs and pumps under all insurance plans, with a similar out-of-pocket limit for privately insured and uninsured individuals. Federal price negotiation should also be applied to diabetes technologies to prevent manufacturers from charging exorbitant prices for these devices.

Additionally, the U.S. healthcare system's reliance on employer-sponsored insurance leaves millions of vulnerable individuals without reliable access to medical necessities, including diabetes technologies. A transitional solution could involve mandating that all employers, including those offering part-time or contract positions, offer comprehensive diabetes device coverage. However, a long-term solution requires moving toward a more universal healthcare model, where coverage is not tied to employment status. Countries like the United Kingdom, where the National Health Service (NHS) provides CGMs to all T1D patients (Wager & Cox, 2024, pg. 1-24), demonstrate that universal access is both feasible and cost-effective, reducing long-term complications and hospitalizations.

Another critical reform is challenging the monopolistic pricing of diabetes technologies by supporting non-profit or public manufacturing alternatives. The success of the "OpenAPS" (Open Artificial Pancreas System) project—a patient-driven initiative that developed an affordable, open-source insulin delivery system—proves that innovation can exist outside corporate profit models (Lewis, 2020, pg. 203-213). The U.S. government could fund similar initiatives through agencies like the Biomedical Advanced Research and Development Authority (BARDA), which already invests in public-health-driven medical solutions. By creating a public competitor to private manufacturers, the market could be forced to lower prices, much like generic drugs do for pharmaceuticals.

Provider education is another key component. Many primary care physicians, particularly in rural or underserved areas, are unaware of the latest medical technology guidelines or hesitate to prescribe them due to cost concerns (Xu et al., 2021, pg. 20) . Medical schools and continuing education programs should integrate training on diabetes device prescribing, emphasizing their role in reducing long-term complications. The CDC’s National Diabetes Prevention Program could expand its scope to include provider outreach, ensuring that clinicians understand how to advocate for their patients’ access to CGMs and pumps.

Risk society theory highlights how institutional failures breed public distrust, particularly when policies seem to prioritize profits over patient well-being. To rebuild trust, insurers and manufacturers must be held accountable for coverage denials and price increases. A federal database—modeled after Medicare’s "Physician Compare" tool—could publicly track insurers’ approval rates for diabetes devices, exposing disparities in access (*Care Compare: Doctors and Clinicians Initiative* | *CMS*, 2024). Similarly, manufacturers should be required to justify price hikes beyond inflation, as seen in states like Nevada, which passed insulin pricing transparency laws in 2017. Greater oversight, combined with patient advocacy campaigns, can pressure stakeholders to prioritize health equity over financial gain.

These solutions underscore that equitable access to diabetes technologies requires both immediate policy fixes and long-term structural change. By standardizing coverage, regulating costs, and shifting toward public-health-driven models, the U.S. can begin to treat CGMs and insulin pumps as essential medical tools rather than luxury commodities. Without such reforms, disparities will persist, exacerbating the "manufactured risks" described by risk society theory—where marginalized communities bear the consequences of a system designed to exclude them. The path forward must center on the principle that healthcare is a right, not a privilege, and that no patient should face unnecessary barriers to managing a chronic condition like Type 1 diabetes.

Conclusion

The disparities in access to continuous glucose monitors (CGMs) and insulin pumps for Type 1 diabetes (T1D) patients are a direct consequence of structural flaws in the American healthcare system. As this paper has demonstrated, the U.S. system—characterized by its reliance on employer-based insurance, fragmented public programs, and profit-driven medical technology markets—creates unnecessary barriers for patients who depend on these life-sustaining devices. Medicare and Medicaid coverage remains inconsistent across states, private insurers impose restrictive prior authorization requirements, and inflated pricing by manufacturers places these technologies out of reach for many. These systemic failures disproportionately harm marginalized groups, including low-income individuals, communities of color, and those without stable employment, exacerbating existing health inequities.

Analyzing these dynamics through the lens of the political economy of health reveals how economic and political factors in the United States intertwine to prioritize profit over patient well-being. Diabetes technologies are treated as commodities rather than essential medical tools, with access dictated by corporate interests and a complex bureaucracy rather than clinical need.

Meanwhile, risk society theory highlights the broader consequences of these inequities. As policies shift with political administrations and insurers deny coverage based on cost-cutting measures, patients are left to navigate an unstable system that decreases their trust in institutions and worsens long-term health outcomes.

However, these challenges are not unsolvable. Meaningful reform is possible through a combination of policy interventions, structural changes, and institutional accountability. Standardizing Medicare and Medicaid coverage for CGMs and insulin pumps nationwide, capping out-of-pocket costs, and decoupling healthcare access from employment would address immediate gaps in care. Longer-term solutions, such as public investment in non-profit manufacturing of diabetes technologies and the expansion of universal healthcare models, could realign the system toward equity. At the institutional level, eliminating prior authorization hurdles, improving provider education, and enforcing pricing transparency would reduce bureaucratic burdens and rebuild patient trust.

There is an urgent need for these reforms. Without systemic change, the U.S. will continue to perpetuate a healthcare landscape where access to life-saving innovations is determined by wealth, zip code, or employment status. By centering patient need over profit and reimagining healthcare as a public good rather than a market commodity, policymakers can ensure that all individuals with T1D have the tools they need to thrive.

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